Guidelines for management of chemicals and hazardous waste in schools

Alberta
EDUCATION

Alberta
Special Waste
Management
Corporation

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Responsibility of school jurisdictions

Our lifestyles and workstyles have an impact on our environment. As students or staff we need to realize that as workers and as consumers we are involved directly with potentially hazardous chemicals and wastes.

Schools are worksites for both the students and staff. Worksite health and safety is of concern on two counts. First, to ensure that the immediate working conditions are not putting the students and staff into a situation of undue exposure to chemical risks. Basic to this is providing **proper information**, i.e. **WHMIS**. Second, to be effective, health and safety information must be incorporated into the regular working routine of people who handle chemicals. Schools are fundamentally places of learning and teaching. It is both natural and essential that schools incorporate proper chemical management to demonstrate, by example, how students can be environmentally responsible managing potentially hazardous materials and wastes at home and on the job.

The keys to protecting our environment are **responsibility** and **action**. It is no longer sufficient to increase student awareness of environmental problems; it is important to empower them to be involved in their resolution.

Social responsibility

As major institutions in society, school jurisdictions must conduct themselves in a responsible manner. Considerations go beyond their borders and they must ensure that all actions taken are with the best interests of all members of society, both now and in the future.

Educational responsibility

There is a need to ensure that students are given the best instruction in matters related to safety and chemical management. This includes modelling good practice in matters of proper handling of chemicals and wastes.

Complying with legal requirements

1. It is the responsibility of schools and school systems to ensure compliance with legal requirements. Schools should obtain and become familiar with the pertinent Alberta legislation. A school is a generator of hazardous waste but not a receiver for disposal or a licensed carrier.

2. Hazardous substances in schools are regulated by Alberta laws. These include:
   - Public Health Act: Waste Management Regulation
   - Workplace Hazardous Materials Information System (WHMIS)
   - Occupational Health and Safety Act: Chemical Hazards Regulation
   - Hazardous Chemicals Act: Hazardous Waste Regulation

3. Movement of hazardous substances from any site is regulated by The Transportation of Dangerous Goods Control Act. A disposer of chemicals must be licensed by Alberta Environment under the Clean Air Act and/or The Clean Water Act.

Chemical and hazardous waste management plan

Purpose

A well-designed chemical and hazardous waste management plan is the key element in jurisdiction and school environmental health and safety programs. It will guide all related decision making. It will ensure that proper chemicals are available; that they are used, stored, transported and disposed of in a safe manner; and that necessary information is readily available and understood by staff and students. The Plan will address budgeting for purchasing, labelling, storage, disposal and transportation of hazardous materials. It will be effective operationally and instructionally.

Development

All those affected by the plan must be consulted in the development of the plan. External consultation also can be valuable. The development process should allow for both.

Features

Management guidelines

The public has become aware and concerned about hazardous chemical spills and disposal in Alberta's environment, including schools and worksites. The Occupational Health and Safety Act and the WHMIS regulate the storage and handling of hazardous chemicals at worksites, including schools. It is important to recognize these factors to help develop positive attitudes in our students and community toward safety and environmental protection.

Responsible management of chemicals and hazardous wastes means to:

- Budget to include purchase, storage, and disposal
- Plan for appropriate purchases to meet the needs of the classroom
- Know what chemicals are on site
- Plan for chemical usage
- Comply with WHMIS
- Store chemicals properly
- Dispose of surplus or waste chemicals annually in a safe manner

Become informed and involved in responsible chemical usage. Set a positive example for students and the community.

Purchase

1. *Determine chemicals required.*
   - Determine appropriate quantities of chemicals required.
   - Purchase what is planned for current use:
     – liquid chemicals in amounts that will be used within one or two years.
     – dry, powdered materials in amounts that will be used in three years
   - Purchase least toxic alternatives.
   - Develop purchase plans that reflect curriculum changes.
   - Encourage the use of consumer products. Over–the–counter products from local retailers are properly labelled (extra MSDSs are not required, unless the original label is damaged).
   - Recognize the shelf life of individual materials.
   - Chemicals should be replaced when they deteriorate or become contaminated.
2. *Ensure legal delivery to instructional site, either by commercial carrier, or properly permitted staff of the jurisdiction.*

Inventory

1. *Establish an inventory to include at least:*
   - Name of chemical
   - Supplier
   - Verification and date of MSDS
   - Date of purchase
   - Courses in which chemical is used
   - Inventory review date
   - Hazard classification
   - Storage location
   - Disposal

   For a sample inventory form see Appendix I.

2. *Update the inventory annually, reflecting curriculum changes*

3. *Advantages of an inventory*
   - Integration of computer support systems
   - Information base for:
     - ordering
     - insurance claims
     - waste disposal
     - WHMIS compliance
     - coordinating chemical users
   - Program and support continuity when staff changes
   - Encourage sharing through computer networking
     - MSDSs
     - standardizing labelling
     - coordinate and reduce costs of disposal
     - waste recycling opportunities

       (For example, industrial arts programs take in projects to repair autos with the intention of preparing the student to be handy in the autobody shop. A feature of the autobody shop of the future may include the operation of equipment that reclaims gycol in antifreeze . . . or equipment that reclaims solvents used in autobody work.)

Use

1. *Meet WHMIS requirements*
   - labelling (supplier, worksite, clear label)
   - MSDS
     - need to be updated every three years
     - readily accessible where the chemical is used

2. *Ensure proper instruction for handling of chemicals and their products.*

Storage

1. *Chemicals for use*
   - Refer to inventory practices
   - Rotate stock
     - use opened container prior to opening new stock
     - use older stock first
     - date all containers
   - Check current Alberta Fire Code for storage of flammable materials
   - Know chemical shelf–life
   - Identify and remove contaminated or deteriorated chemicals
   - Store chemicals safely (Appendix II)

2. *Chemical wastes for proper disposal*
   - Store surplus chemicals and hazardous wastes safely
   - Attach proper identification and labels
   - Inventory waste material
   - Categorize waste by class (Appendix III)
   - Avoid physical contact between waste groups when wastes are stored
   - Use a separate area for storage and label it **"For disposal. Do not use!"**

Proper disposal

When buying chemicals for school use, funds should be allocated for proper disposal. Responsible disposal procedures should be established.

1. **Surplus chemicals**
   - Chemicals should be disposed of when they deteriorate or become contaminated.
   - Liquid chemicals in excess of amounts that will be used within one to two years
   - dry, powdered materials in excess of amounts that will be used within three years
   - chemicals in storage but not in use for three years or more
   - chemicals not utilized in current teaching lessons
   - chemicals unsuited to a grade level (particularly important for elementary and junior high schools)
   - chemicals for which use is unplanned, or uncertain
   - chemicals for which MSDSs are not available
   - chemicals that are not properly labelled, or inventoried
   - excess supply, several containers of the same chemical or unnecessarily large bulk quantities
   - chemicals that you do not wish to label, to provide MSDSs for and to inventory
   - unknown chemicals, or chemicals without a WHMIS label

2. **Hazardous wastes** (materials requiring special disposal procedures)
   - For chemicals and hazardous wastes requiring disposal at a licensed facility see Appendix IV
   - Substances that are designated as hazardous within the Transportation of Dangerous Goods Control Act.
   - All hazardous wastes, if a school (generator) produces 5 kg or more of solid, or 5 L or more of liquid, of total hazardous wastes per month
   - Any substance, in any quantity, listed in Table 2 of the Alberta Hazardous Waste Regulation (see Appendix VI);
   - Any containers of unknown substances

   These materials must be removed from the school by a licensed carrier and disposed of by a licensed receiver.

   Obtain and be aware of local or municipal regulations, by–laws, or policies regarding sewer, landfill, and environment, when considering or planning chemical disposal.

3. **Environmental responsibility**
   Education plays a major role in shaping the attitudes of our young people. Students will carry the attitudes that they learn in school throughout their lives. Consequently, they learn attitudes of environmental responsibility from their teachers and peers.

   School personnel should accept their responsibilities to students and to the environment in the day–to–day management of school laboratories and materials.

Development

Past experience indicates that all those affected must be consulted in the development of the plan. The development process allows for external consultation, which will be valuable to teachers and administrators:

- to assist in the development of chemical and hazardous waste management plans
- for co-ordination among schools and school jurisdictions
- to identify other resources for specific requests
- to implement the chemical and hazardous waste management plan

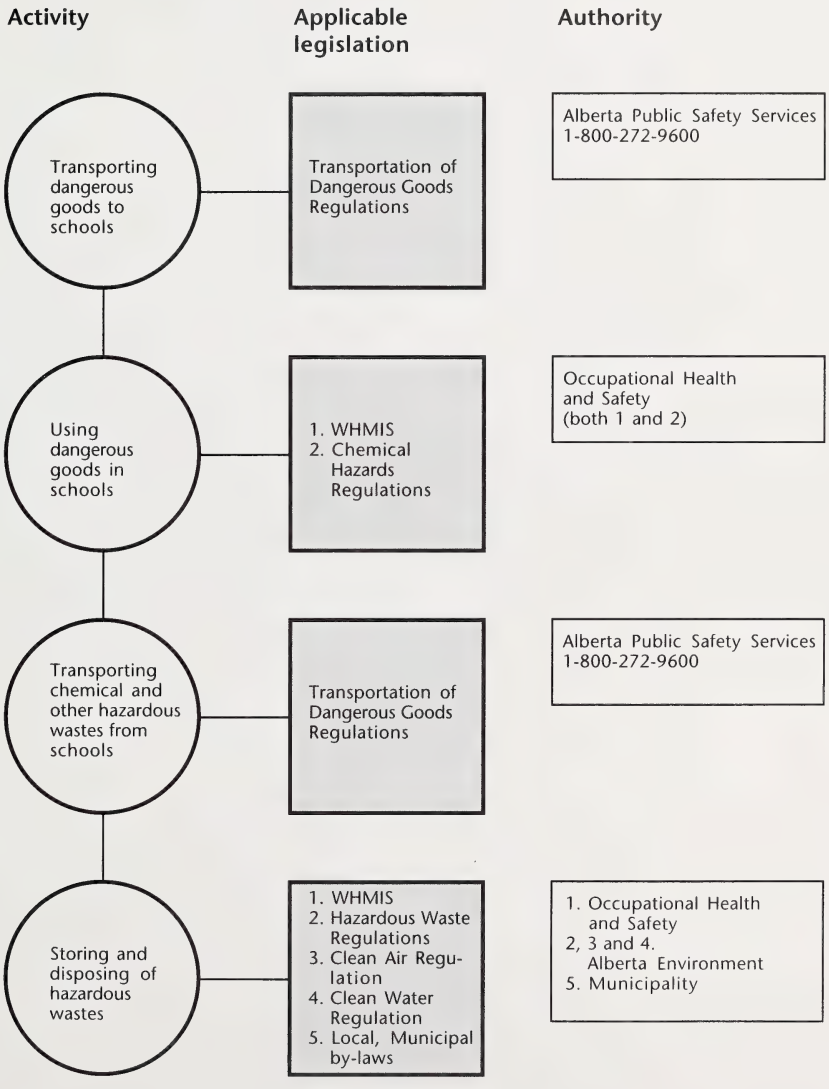
Monitoring

Local school jurisdictions should regularly monitor the implementation of their chemical and hazardous waste management plan. This monitoring should provide for continuing improvement of the plan and operating procedures in order to comply with changing circumstances and regulations.

All employees should be knowledgeable of the chemical and hazardous waste management plan and kept informed of changes in its implementation.

If you have any questions refer to the chart below for contact agencies.

Summary of legislation applicable to handling of dangerous goods in school systems



Appendix I

Chemical inventory sheets

Chemical management plan inventory – *example*

review date _____

Chemical	Quantity	Supplier	MSDS mo/yr	Purchase date	Use of chemical at worksite (class)	Hazard class/TDG	Storage location	Program disposal
Aqua Ammonia	2L	Fresh	03/89	02/91	Glass cleaner	9	Janitor's room 104	
natural pyrethrin (insecticide)	2 cans	Blaster Inc.	09/88	11/89	For pest control	6	Janitor's room F09	triple rinse container
Thermoplastic powder (toner)	3 cartridges	Image Perfect	07/88	01/90	Photocopier	9	Cupboard next to photocopier	
Phenidone (developer)	1 gal	Photo Improve	contract	02/89	Photography	6	Cupboard in darkroom	save for annual treatment
Toluene	2 gal	Clean Rite	contract	01/90	Art 20 IA 10/20/30	3	Cupboard in paint room	keep for use
Acetate ink	20 tubes 100mL	Bright and Sharp	on tubes	03/87	Art 30	6	Drawing supply cupboard	
Bleach	1 gal	Whiter Brighter	contract	02/90	General cleaning, all Art classes	9	Below sink	
Acetic acid (glacial)	4L	Chem North	11/89	12/89	Chemistry 10/20/30	8	Vented acid cupboard	
Brass polish	2 cans	Genie	3/89	9/90	Home Economics	varies 8 acidic 6 poisonous	Below sink	
Varsol	3 gal	Your Hardware Store	2/89	02/90	Wood Shop	3	Metal cabinet beside sink	
Ethanol	2L	Chem North	01/90	01/90	Biology 30 Chemistry 30	3	Flammable liquids cupboard	
Battery acid	5 gal	Vroooom	02/90	04/90	Auto Mechanics	8	Glass jug in cabinet beside garage door	
Sodium	500g	Easy Blow	11/89	?	none	4	Locked DO NOT USE cupboard	ASAP/remove potential hazard

Chemical management plan inventory

review date _____

Chemical	Quantity	Supplier	MSDS mo/yr	Purchase date	Use of chemical at worksite (class)	Hazard class/TDG	Storage location	Program disposal

Appendix II
Chemical storage guidelines

Storage facilities

Secondary schools should be provided with a separate storage facility for chemicals. A forced–air exhaust system should be provided for this area to prevent the buildup of fumes.

It is an advantage for elementary schools and others that keep small quantities of low–hazard chemicals to have a storeroom outside the classroom for safe storage in clearly–marked cupboards.

Only very low–hazard chemicals should be stored in a classroom or laboratory and only in closed cupboards.

Chemical storage cupboards should be made of wood, and enclosed by doors. Open shelves will restrict the types of chemicals that can be stored safely. All cupboards should have some ventilation; usually loose–fitting doors or the spaces around doors are sufficient.

Cupboards for the various chemical categories are best separated from each other by a wooden partition. Lack of proper separation creates the possibility of mixing incompatible chemicals through spills, breakage, leakage, dust or fumes.

Gas burners should not be used in chemical storage rooms. Gas supplies to these rooms should be shut off permanently.

Storage practice

All chemicals in storage must be labelled to comply with WHMIS laws. In addition, the date received and the name of the school should be shown on the containers.

A binder of MSDSs must be readily available in the area where chemicals are stored and used.

Liquids in large glass bottles, or any hazardous materials, should be stored in a location that is below eye level.

Form a seal around the lids of bottles containing materials that release vapors, using plastic electrical tape or "parafilm".

Cylinders of compressed gas can become powerful and dangerous jet–propelled projectiles if the neck or valve is broken off, and can easily penetrate a school wall (or student), or spin dangerously. Large cylinders should be anchored so that they cannot fall over; small cylinders should rest on their sides in such a manner that they cannot roll or fall, and with the valve facing away from the wall. Refer to Occupational Health and Safety Regulations for storage and handling requirements.

Chemical storage schemes

A storage scheme for chemicals should result in the separation of incompatible groups and the isolation of those that present special hazards. Storing all chemicals together in alphabetical order is not adequate. Separating one or two groups, such as acids and flammables, is not much better.

The schemes that follow can be used to provide safe storage of chemicals in schools. The information and diagrams provide guidance for safe storage schemes, and are adaptable to facilities of various designs.

Scheme 1

This will provide adequate separation for a fairly extensive collection of chemical materials. (See Figure 1, page 15.)

1. **Mineral acids**
   Mineral acids should be stored in well–painted wood cupboards without metal pipes, valves or other metal objects in them, and separated from other cupboards by at least a partition. Some commercial cabinets with acid–resistant paint are satisfactory.

   Nitric acid is also a strong oxidizing agent and suitable precautions should be taken with its storage. It will build pressure over time and should be vented periodically.

   Parafilm or plastic electrical tape can be placed around lids for storage, to help prevent the escape of fumes. Plastic lids will deteriorate with time and should be replaced when this occurs.

2. **Strong bases**
   Some of these will react with glass containers to form a filmy precipitate, and are best stored in base–resistant plastic bottles. Those that emit fumes should be sealed with parafilm or electrical tape.

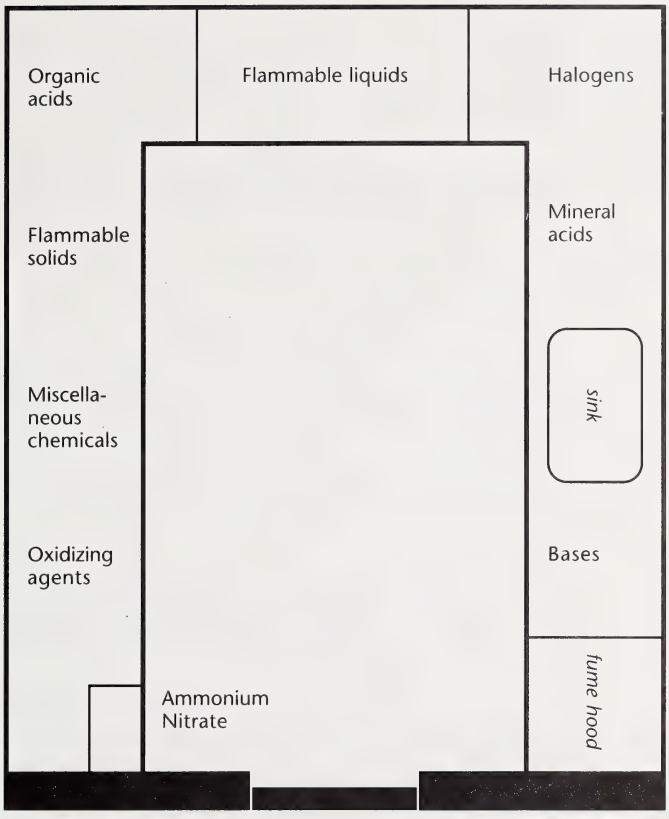


Figure 1
Separation of chemicals in a chemical storeroom

A storeroom such as this should be provided with an exhaust fan, as well as other safety equipment that is necessary.

Bunsen or other gas burners should not be used in this room.

3. **Organic acids**
   Store acid anhydrides with this group.

4. **Flammable solids**
   Note that this category includes alkali metals, powdered metals, powdered carbon and others. Oxidizing agents must be kept away from this cupboard and the materials in it.

5. **Flammable liquids**
   Most organic liquids are included here. Flammable liquids should be stored in a cool, well–ventilated cupboard, separated from other cupboards by at least a partition, clearly labelled, and away from exit routes.
   Refer to the current Alberta Fire Code for regulations governing the type, location, allowed quantities and other requirements for these storage facilities.

6. **Oxidizing agents**
   There should be no paper, cardboard, cloth or other flammable materials in this cupboard. Precautions must be taken to avoid contamination with dust or other chemicals.
   Ammonium nitrate is an extremely strong oxidizing agent and is incompatible with most other chemicals. It should be stored away from other materials. It is not a necessity in school programs, and it would be best not to use or store it in schools.

7. **Halogens**
   These should be stored in a cupboard that is separated from other cupboards by at least a partition. Lids on bottles should be sealed with parafilm or electrical tape.

8. **Miscellaneous**
   This includes most materials not included in any of the previous categories. Some further separation may be desirable if available storage facilities allow.

Flammable liquids must not be stored in a refrigerator, unless it is specially designed and explosion proof.

Scheme 2

This will provide adequate separation for elementary and most junior high school chemicals, where small quantities of low–hazard materials are on hand. (See Figures 2 and 3, page 18.)

Hazardous materials such as acids, bases, iodine and others should be obtained and stored as dilute solutions.

Chemicals should be purchased as consumer products, from retail stores, as much as possible.

1. **Acids**
   This cupboard should not contain any metal fixtures or objects.

2. **Bases**
   This cupboard should not contain any metal fixtures or objects.

3. **Oxidizing agents**
   These materials must be kept away from any flammable liquids or solids, or materials such as paper or cloth.

4. **Flammable solids**
   These must be kept away from oxidizing agents. Flammable solids include metal powders, carbon, charcoal and similar materials.

5. **Flammable liquids**
   These should be stored in a cool, well–ventilated cupboard, separated from other cupboards by at least a partition and clearly labelled. Refer to the current Alberta Fire Code for regulations governing type, location, labelling, allowable quantities and other requirements for these storage areas.

6. **General**
   This category includes any materials not in any of the other categories.

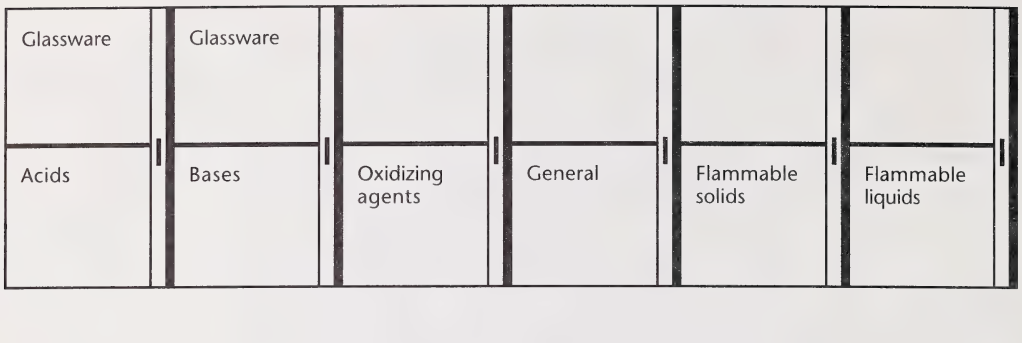


Figure 2
Chemical storage cupboards suitable for a small elementary or junior high school

Figure 2 illustrates storage of **small quantities** of **low–hazard** chemicals. It is not suitable for most high school needs. These cupboards must **not** be airtight.

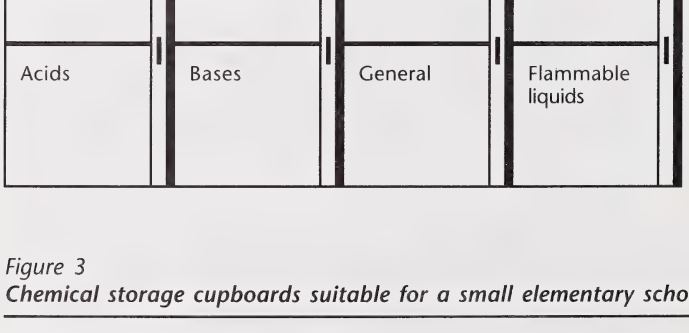


Figure 3
Chemical storage cupboards suitable for a small elementary school

Figure 3 illustrates storage of **small quantities** of **very low–hazard** materials. Acids, bases and oxidizing agents will be *very weak,* flammable liquids will be of **very low hazard**. These cupboards must **not** be airtight.

Appendix III
Hazardous materials in schools

Special wastes are not always hazardous in all situations. Used lubricating oil, for instance, is harmless when collected and stored properly. Dumped into our surface water, it endangers an entire chain of living creatures from micro–organisms to human beings. If we want to protect our environment, it is time to take responsibility for the proper disposal of school chemicals

"Special" wastes are those which, because of their chemical composition, require careful management and special treatment. Otherwise, they are a potential hazard to life, health or the environment. They have been specified by Transportation of Dangerous Regulations into nine classes of potential hazard:

Class 1 • Explosives
those substances that may explode easily through heat, shock, or friction. (regulated federally)

Class 2 • Gases
those gases under pressure which are flammable, poisonous or corrosive, for example chlorine.

Class 3 • Flammable liquids
those liquids that are highly combustible, such as painting wastes, degreasers, other solvents, and organic liquids.

Class 4 • Flammable solids
those solids that are highly combustible, or produce flammable product on contact with water. Also includes materials subject to spontaneous combustion such as Sodium, Potassium, Phosphorus, and powdered metals.

Class 5 • Oxidizing agents
substances that cause combustion of flammable materials, and reactive agents such as bleaches, nitrates, fertilizers, and chlorates.

Class 6 • Toxic
those substances containing material causing immediate and serious toxic effects or long–term toxic effects, such a substances containing: Heavy metals (for example, mercury lead, barium, cadmium, or chromium); carcinogens; benzene (tannic acid, chromium compounds); other poisonous substances or biohazardous material.

Class 7 • Radioactive
There should be no radioactive materials in schools so this class does not appear on the inventory (regulated federally).

Class 8 • Corrosive
those substances containing material that causes corrosion such as rust removers, waste acids, strong bases, strong acids, muriatic acid, battery acid, oven cleaners, and drain cleaners.

Class 9 • Other
those substances that are hazardous and do not appear to fit the above categories such as asbestos or anthracene (a pervasive allergen).

Below are the symbols used to show type and class of hazard in household packaging (Figure 1) and the WHMIS symbols used on commercial and industrial containers (Figure 2).

Figure 1
Hazardous symbols found on household products

Symbols show *type* of hazard; frames show *degree* of hazard. Symbols will always appear inside a frame.

Class A Compressed gas

Class B Flammable and combustible material

Class C Oxidizing material

Class D Poisonous and infectious material

1. Materials causing immediate and serious toxic effect

2. Materials causing other toxic effects

3. Biohazardous infectious material

Class E Corrosive material

Class F Dangerously reactive material

Figure 2
WHMIS symbols

These symbols always appear inside a circle.

Appendix IV
Chemicals that make unrinsed empty containers hazardous wastes

adapted from Table 2, Alberta Hazardous Waste Regulation

A

3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin, and salts
Acetato-O-phenylmercury
1-Acetyl-2-thiourea
Acrolein
Aldicarb
Aldrin
Allyl alcohol
Aluminum phosphide
5-(Aminomethyl)-3-isoxazolol
5-(Aminomethyl)-3(2H)-isoxazolone
4-a-Aminopyridine
N-(aminothioxomethyl) acetamide
Ammonium picrate
Ammonium vanadate
Arsenic acid
Arsenic (III) oxide
Arsenic (V) oxide
Arsenic pentoxide
Arsenic trioxide
Aziridine

B

Barium cyanide
Benzenethiol
Benzyl chloride
Beryllium powder
Bis(chloromethyl) ether
Bromoacetone
1-Bromo-2-propanone
Brucine

C

Calcium cyanide
Carbamimidoselenoic acid
Carbon bisulfide
Carbon disulfide
Carbonyl chloride
Chlorine cyanide

Chloroacetaldehyde
p-Chloroaniline
4-Chlorobenzenamine
Chloromethylbenzene
2-Chlorophenylthiourea
1-(o-Chlorophenyl) thiourea
3-Chloropropionitrile
Copper cyanides
Cyanides - soluble salts
Cyanogen
Cyanogen chloride
2-Cyclohexyl-4,6-dinitrophenol

D Dichlorophenylarsine
Dieldrin
Diethylarsine
O,O-Diethyl S-2-(ethylthio)ethyl phosphorodithioate
O,O-Diethyl S-(ethylthio)methyl phosphorothioate
Diethyl-p-nitrophenyl phosphate
O,O-Diethyl O-(p-nitrophenyl) phosphorothioate
O,O-Diethyl O-pyrazinyl phosphorothioate
Diisopropyl fluorophosphate
Dimethoate
2,3-Dimethoxy-strychnidin-10-one
O,O-Dimethyl-O-{p-(dimethylaminosulfonyl)phenyl} phosphorothioate
O,O-Dimethyl-S-{2(methylamino)2-oxoethyl} phosphorodithionate
3,3-Dimethyl-1-(methylthio)-2-butanone, O-{(methylamino)carbonyl} oxime
O,O-Dimethyl-O-p-nitrophenyl phosphorothioate
Dimethylnitrosamine
a,a-Dimethylphenethylamine
1,1-Dimethyl-2-phenylethanamine
4,6-Dinitro-o-cresol and salts
4,6-Dinitro-o-cyclohexylphenol
2,4-Dinitrophenol
2,4-Dinitro-6-methylphenol
2,4-Dinitro-6-(1-methyl-propyl) phenol
2,4,6-trinitrophenol, ammonium salt
Dinoseb
Disulfoton
2,4-Dithiobiuret
Dithiopyrophosphoric acid, tetraethyl ester

E

Endosulfan
Endothall
Endrin
Epinephrine
Ethyl cyanide
Ethylenimine

F

Famphur
Fluorine
Fluoroacetamide
2-Fluoroacetamide
Fluoroacetic acid, sodium salt
Fulminic acid, mercury (II) salt (fulminate of mercury)

H

Heptachlor
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene
1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, endo-1,4,5,8-dimethano-naphthalene
1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, exo-1,4,5,8-dimethano-naphthalene
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,endo-dimethanonaphthalene
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,exo-dimethanonaphthalene
Hexachlorohexahydro-exo,exo-dimethanonaphthalene
1,4,5,6,7,7-Hexachloro-5-norbornene-2,3-dimathanol, cyclic sulfite
Hexaethyl tetraphosphate
Hydrazinecarbothioamide
Hydrocyanic acid
Hydrogen cyanide
Hydrogen phosphide
4-{1-hydroxy-2-(methylamino)ethyl}-1,2-benzenediol
2-Hydroxy-2-methylpropionitrile

I

Isocyanic acid, methyl ester

M

Mercury fulminate
Methomyl
2-Methylaziridine
N-{(methylcarbamoyl)oxy} thioacetimidic acid, methyl ester
bis (1-methylethyl) phosphofluorate
Methyl hydrazine
2-Methyllactonitrile

2-Methyl-2-(methylthio)-propanal, O{(methylamino)carbonyl}oxime
N-Methyl-N-nitrosoethanamine
Methyl parathion
(S)-3-(1-methyl-2-pyrrolidinyl) pyridine, and salts

N

1-Naphthalenylthiourea
a-Naphthylthiourea
Nickel carbonyl
Nickel cyanide
Nickel (II) cyanide
Nickel tetracarbonyl
Nicotine and salts
Nitric oxide
p-Nitroaniline
4-Nitrobenzenamine
Nitrogen dioxide
Nitrogen (II) oxide
Nitrogen (IV) oxide
Nitroglycerine
N-Nitrosodimethylamine
N-Nitrosomethylvinylamine

O

Octachlorocamphene
Octamethyldiphosphoramide
Octamethylpyrophosphoramide
Osmium oxide
Osmium tetroxide
7-Oxabicyclo (2,2,1) heptane-2,3-dicarboxylic acid
Oxybis(chloromethane)

P

Parathion
Phenyl dichloroarsine
Phenyl mercuric acetate
Phenylthiourea
N-Phenylthiourea
Phorate
Phosgene
Phosphine
Potassium cyanide
Potassium silver cyanide
Propanenitrile
Propargyl alcohol
2-Propenal

2-Propen-1-ol
1,2-Propylenimine
2-Propyn-1-ol
4-Pyridinamine

S Selenourea
Silver cyanide
Sodium azide
Sodium cyanide
Strontium sulfide
Strychnidin-10-one, and salts
Strychnine and salts

T Tetraethyl plumbane
Tetraethyldithiopyrophosphate
Tetraethyl lead
Tetraethylpyrophosphate
Tetranitromethane
Thallic oxide
Thallium (III) oxide
Thallium (I) selenite
Thallium (I) sulfate
Thiofanox
Thioimidodicarbonic diamide
Thiophenol
Thiosemicarbazide
Toxaphene
Trichloromethanethiol
Trinitrate-1,2,3-propanetriol

V Vanadium pentoxide
Vanadium (V) oxide

W Warfarin (conc. more than 0.3%)

Z Zinc cyanide
Zinc phosphide (conc.more than 10%)

Appendix V
Transportation of waste chemicals from school laboratories

General

The Transporation of Dangerous Goods (TDG) Act was passed by the Government of Canada in 1980. Subsequent Regulations became law in 1985. This legislation regulates the transport of hazardous chemicals, including wastes, by air, rail, marine and interprovincial road modes. All the provinces and territories have adopted the operational portions of this legislation for road transport solely within the province or territory.

This bulletin sets out a procedure to safely transport hazardous wastes from schools within Alberta to an acceptable disposal site. Within Alberta this site is located at Swan Hills. Throughout this document hazardous wastes is intended to mean "wastes which are dangerous goods", as defined by the TDG Regulations.

The full TDG Regulations should be consulted before you ship, carry or receive hazardous wastes. Contact Alberta Public Safety Services at any time if you have any questions on the transport of waste chemicals.

Who should use this guide?

The generator of a waste has a responsibility for identifying whether it is a hazardous waste and preparing it for shipment. The carrier is responsible for safely moving the hazardous wastes and for the disposal of the wastes. This brochure will be useful to anyone who generates, handles, transports, treats, stores or disposes of small quantities of hazardous wastes.

Classification of hazardous wastes

The TDG Act requires that chemicals are grouped into one or more classes from Table 1. Several of these **classes** are then further sub-grouped in **divisions** based on degree of hazard.

Table 1. **TDG classes**

Class	Risk
1	explosive
2	compressed gas
3	flammable liquid
4	flammable solid, pyrophoric or "dangerous when wet"
5	oxidizer or organic peroxide
6	poisonous or infectious
7	radioactive
8	corrosive
9	miscellaneous

To classify a waste material there are several steps that must be followed. Three situations are described below which should cover the most common situations that laboratory managers encounter.

1. If the material has not been altered chemically since it was received from the supplier and it still meets the criteria for Classes 2 to 6 or Class 8, then the relevant classification information should be as described on the shipping documentation received from the supplier. The only change necessary is to precede the shipping name with the word "waste".

   For example, if you wish to dispose of a bottle containing some Diethylamine then the classification would be:

   Shipping name: Waste Diethylamine
   UN number: UN1154
   Class: 3.1
   Sub-class: 9.2
   Packing group: II

2. If the material has been diluted with other non-regulated chemicals, such as water, so that it no longer meets the criteria for Classes 2 to 6 or Class 8 but it has a Sub-class of 9.2 then the waste is still regulated.

   For example, if the Diethylamine described above had been diluted to 3% with water so that it no longer met the criteria for a Class 3 Flammable Liquid, then the classification of the mixture would be:

   Shipping name: Waste contaminated with Diethylamine
   UN number: does not apply
   Class: 9.2
   Packing group: III

3. If the waste material is a mixture of two or more regulated chemicals with similar classifications (for example, all are Corrosive Liquids and no secondary hazard exists) then the classification can be determined.

   For example, a container of miscellaneous acids has been collected and is now ready for disposal. The mixture contains approximately 30% Hydrochloric Acid, 12% Acetic Acid and the remainder water. The classification would be:

   Shipping name: Waste Corrosive Liquids, NOS (Hydrochloric Acid)
   UN number: UN1760
   Class: 8
   Sub-class: 9.2
   Packing group: II

   The acid named in brackets after the NOS (Not Otherwise Specificed) is required because Hydrochloric Acid represented the largest volume of corrosive material in the mixture.

   The packing group was selected because neither acid in the mixture has a packing group less than II as shown in the TDG Regulations. Choose the lowest packing group of all the constituents so that you represent the worst risk that may be encountered.

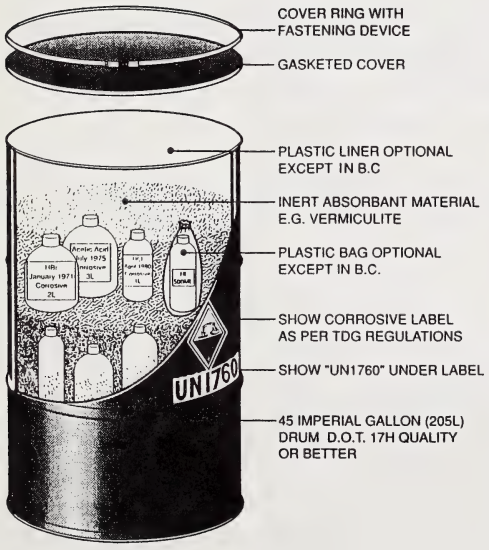


Figure 1
Typical Labpack

Packing requirements

Alberta Public Safety Services and Transport Canada recommend the use of "Labpacks" for the transportation of small quantities of compatible wastes for school laboratories. A typical "Labpack" might include left-over chemicals, samples, out-of-date material and used (unwashed) containers. A schematic of a typical "Labpack" is shown in Figure 1. It is best if wastes that have different classes are packed in different "Labpacks".

Certain classes of wastes should not be included in "Labpacks". These are: explosives, radioactives, infectious substances, PCBs or unidentified materials. Special packaging and transporation arrangements may also be necessary for shock-sensitive materials.

Preparation of labpacks

Each individual waste must be sealed within an inner container carrying an identifying label. Inner containers are then packed in a steel drum and surrounded by inert filler material.

Identification of wastes

Each inner container should be labelled with a description of its contents. This description should include, whenever possible:

- the specific chemical name and generic name (not a trade name) of the waste
- its approximate date of purchase
- its chemical Class and Sub-class
- the approximate quantity

Examples of inner container labels are:

Muriatic Acid (HCl)	Temik (aldicarb)
May 1988	May 1988
Class 8 Corrosive Liquid	Class 6.1 Poisonous Solid
250 mL	500 g

Unknown waste material should be segregated for characterization testing by the treatment organization or a suitable analytical laboratory.

Storage of wastes

All wastes awaiting removal in "Labpacks" should be clearly identified as hazardous waste, and stored securely in accordance with provincial and municipal government requirements.

Inner containers

An inner container may be of metal, glass, plastic, fiber or any material which will not react with its contents. All inner containers should be securely sealed to prevent accidental release of its contents.

Transit drums

Different classes of waste should be packed in separate openhead drums. All drums must have properly secured gasketed covers, complete with cover rings and fastening bolts. Drums should be of CTC specification 17H quality or better. Modified closed drums with their heads cut off are not acceptable. For details of the 17H specification, contact Alberta Public Safety Services. This container specification provides for drums in several sizes up to a 46 gallon capacity.

Plastic drum liners are optional in Alberta but are recommended.

Filling the drum

The inner containers, individually labelled, are placed in the appropriate transit drums, surrounded by vermiculite or a similar inert absorbent packaging material. There should be enough absorbent material in a "Labpack" to absorb all the liquid wastes in the containers packed in the drum.

Any small container should be sealed in a heavy plastic bag if there is any doubt about its integrity.

Each transit drum must contain waste from one chemical class only.

Documentation

Each drum should be numbered and labelled, according to the TDG Regulations. In addition, a list should be drawn up for each drum, giving the shipping name, class, sub-class, UN number, packing group and the quantity of each chemical packed in the drum. Three copies will be required:

- One copy of the list should be kept on file by the generator while the waste is being stored.
- One copy should be attached to the manifest during transporation.
- One copy should be attached to the manifest which the consignee sends to the regulatory agency in the receiving jurisdiction. In Alberta this is Alberta Environment.

All TDG Regulations for the transportation and handling of hazardous wastes apply to material in "Labpack" form. A waste manifest must be completed and filed with Alberta Environment when a "Labpack" is transported. Obtain copies of the waste manifest form from Alberta Environment.

The shipper, carrier and receiver of the consignment of waste must each retain a copy of all the documentation for at least two years.

Safety marks

The outside of the "Labpack" must show:

- a TDG hazard label for the specific class of wastes it contains
- the TDG shipping name of each inner container
- The UN number of each inner container
- if the "Labpack" contains liquids then a TDG orientation label (two upright arrows)

A list can be attached to the outside of the "Labpack" showing the shipping names and UN numbers of all the different inner containers.

Before any hazardous wastes are loaded onto a vehicle, the person in charge must ensure that at least one set of four placards are placed where they are clearly visible, one placard on each of the four sides of the vehicle. If the consignment is all of one class then use a placard for that class. If there are more than one class of waste in the consignment then use a set of four "DANGER" placards to represent the mixed hazards.

Training

Anyone who handles, offers for transport or transports hazardous wastes must be trained or work under the direct supervision of a trained person. It is the responsibility of each employer to ensure that all employees who require training receive it. In general the areas of training are dependent on the job responsibilities of each employee and should include information in three basic areas: the nature and hazards of the wastes; what to do in the event of an incident (whom to call, how to use safety equipment, etc.); and those aspects of the TDG Regulations that affect each employee.

When the employer is satisfied that the training is adequate then the employer issues a training certificate to each trained employee.

Trained persons should retain their training certificate where it is immediately available in the event a dangerous goods inspector requests that it be produced.

This training certificate is valid for three years and must be revalidated by the employer within one month of expiry.

Spill reporting

Chemical spills in amounts greater than those listed in Table 2 must be reported. The person in charge at the time of a spill must report the incident immediately to: the local police; his employer; the owner, leasee or charterer of the vehicle; and the owner or consignor of the wastes.
The employer of the person who was in charge at the time of an incident must complete a report form describing the incident and sent it to Transport Canada within 30 days when:

- an immediate report has been made
- there has been a release of waste and someone is killed or admitted to hospital
- when damage is found to the integrity of a pressure container
- when there is a suspicion that a container of waste has suffered damage to its integrity resulting from impact, stress or fatigue

A copy of the required report form can be obtained from Alberta Public Safety Services.

Table 2. **Quantities for immediate reporting**

Class/ Division	Quantities
2.1	at least 100 L container capacity
2.2	at least 100 L container capacity
2.3	all
2.4	all
3	At least 200 L
4	At least 25 kg
5.1	at least 50 kg or 50 L
5.2	at least 1 kg or 1 L
6.1	at least 5 kg or 5 L
8	at least 5 kg or 5 L
9.1	at least 50 kg
9.2	at least 1 kg
9.3	at least 5 kg or 5 L

Registration

All shippers, carriers and receivers of hazardous wastes must register with Alberta Environment.

Appropriate contacts

Provincial shipments

Alberta Public Safety Services
Dangerous Goods Control Division
10320 - 146 Street
Edmonton, Alberta
T5N 3A2
☎ (403) 422-9600
1-800-272-9600

Alberta Environment
Waste Management Branch
Pollution Control Division
Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6
☎ (403) 427-5868
1-800-222-6514

International/transborder shipments

Transport Dangerous Goods Directorate
Transport Canada
The Canada Building
Ottawa, Ontario
K1A 0N5
☎ (613) 992-4624

Environment Canada
Conservation and Protection
Place Vincent Massey
Ottawa, Ontario
K1A 0H3
☎ (819) 997-3377

Alberta Public Safety Services thanks Environment Canada for their contribution in the preparation of this Appendix.

PROVINCE OF ALBERTA

HAZARDOUS CHEMICALS ACT

HAZARDOUS WASTE REGULATION

Alberta Regulation 505/87

EXTRACT FROM THE
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ALBERTA REGULATION 505/87

(Filed on December 18, 1987)

HAZARDOUS CHEMICALS ACT

(O.C. 824/87)

Approved and Ordered,
W. HELEN HUNLEY,
Lieutenant Governor, Edmonton, December 17, 1987

Upon the recommendation of the Honourable the Minister of the Environment, the Lieutenant Governor in Council, pursuant to section 16 of the Hazardous Chemicals Act, makes the regulation in the attached Appendix, being the Hazardous Waste Regulation.

DON R. GETTY (Chairman)

APPENDIX

Hazardous Chemicals Act

HAZARDOUS WASTE REGULATION

Table of Contents

Definitions

1 In this Regulation,

(a) "Act" means the *Hazardous Chemicals Act;*

(b) "carrier" means a person accepting for transportation or transporting hazardous wastes for storage, treatment or disposal;

(c) "container" means any portable device less than 454 litres in size in which a hazardous waste is stored;

(d) "empty container" means a container that contains less than 2.5 centimetres of residue remaining at the bottom of the container or less than 3% of the original contents, whichever is the lesser amount;

(e) "generator" means a person consigning hazardous wastes for storage, transportation, treatment, or disposal;

(f) "storage" means the holding of a hazardous waste for a temporary period at the end of which the hazardous waste is

(i) transported;

(ii) treated;

(iii) disposed of;

(g) "receiver" means a person receiving hazardous wastes for storage, treatment or disposal;

(h) "unrinsed empty container" means an empty container

(i) that has not been rinsed 3 times using for each rinse a clean solvent that is in an amount equal to 10% of the container volume and that is capable of removing the contained hazardous waste, or

(ii) that, in the opinion of the Director of Standards and Approvals of the Department, has not been rinsed by a method that produces results equal to or better than those produced by the method set out in subclause (i).

Exemption

2 The following hazardous chemicals are exempt from the Act and this Regulation if they are disposed of as waste:

(a) those wastes that are not listed in Table 1 of the Schedule or defined by the criteria specified in Table 1;

(b) household wastes;

(c) agricultural wastes generated by

(i) the growing and harvesting of agricultural crops, or

(ii) the raising of animals, including animal manures returned to the soil as fertilizers;

(d) mining overburden returned to a mine site as approved pursuant to the *Land Surface Conservation and Reclamation Act* and the regulations under that Act;

(e) fly ash waste, bottom ash waste, slag waste or flue gas emission control waste generated from the combustion of domestic waste, coal, or other fossil fuels as approved pursuant to the *Clean Air Act* or the *Clean Water Act* and the regulations under those Acts;

(f) drilling fluids, produced waters, oily waste, fracture fluids, reformates, completion fluids, process and run-off waters, spent iron sponge or similar sweeteners and waste treater hay resulting from the exploration, development or production of crude oil or natural gas approved pursuant to the *Oil and Gas Conservation Act* and the regulations under that Act, the *Oil Sands Conservation Act* and regulations under that Act or the *Pipeline Act* and regulations under that Act;

(g) irrigation return flows approved pursuant to the *Water Resources Act* and the regulations under that Act;

(h) domestic sewage;

(i) any materials that are for recycling, re-use or reprocessing in facilities approved pursuant to the *Clean Water Act* or the *Clean Air Act* and the regulations under those Acts;

(j) point source discharges licensed pursuant to the *Clean Water Act* or the *Clean Air Act* and the regulations under those Acts;

(k) agricultural chemicals and their empty containers approved pursuant to the *Agricultural Chemicals Act* and the regulations under that Act;

(l) any hazardous waste, except for those containing chemicals listed in Table 2 of the Schedule, produced by a generator in an amount less than 5 kilograms if a solid, or 5 litres if a liquid, per month.

Exemption

3 Section 7.4(1)(a), (b), (d) and (e) of the Act do not apply to a person who treats, stores or disposes of hazardous wastes generated by him on premises occupied by him.

Exemption

4 Sections 7.2, 7.3 and 7.4 of the Act do not apply to a hazardous waste which is transported not more than 1 km on a highway, as defined in the *Highway Traffic Act*, by or for a generator of the hazardous waste between the properties owned or leased by the generator if

(a) the local authority, as defined in the *Transportation of Dangerous Goods Control Act*, is informed of the movement and the nature of the hazardous waste, and

(b) the person in charge of the vehicle transporting the hazardous waste displays on the vehicle a placard that corresponds to the placard set out as Figure 19 in Part II of Schedule V of the *Transportation of Dangerous Goods Regulations* (SOR 85-77) under the *Transportation of Dangerous Goods Act* (Canada).

Manifest form

5 The manifest required by the Act shall be in the form set out in the *Transportation of Dangerous Goods Regulations* (SOR 85-77) under the *Transportation of Dangerous Goods Act* (Canada).

Manifest completion

6 The applicable parts and copies of the manifest must be fully completed by the generator, carrier and receiver of hazardous wastes.

Generator's manifest duties

7 A generator shall

(a) on consigning a hazardous waste,

(i) certify the consignment on all copies of the manifest, and

(ii) have the carrier certify receipt of the waste,

(b) mail the 1st copy of the manifest to the Director of Pollution Control of the Department within 2 days, excluding Saturdays and holidays, after consigning the hazardous waste,

(c) retain the 2nd copy for at least 2 years following the consignment, and

(d) deliver the 3rd, 4th, 5th and 6th copies to the carrier.

Copies accompanying waste

8 The 3rd, 4th, 5th and 6th copies of the manifest must accompany the hazardous waste during transportation.

Carrier's manifest duties

9 The carrier shall

(a) on accepting a hazardous waste for transportation, certify the acceptance on all copies of the manifest,

(b) return the 1st and 2nd copies to the generator, and

(c) deliver the 3rd, 4th, 5th and 6th copies to the receiver.

Receiver's manifest duties

10 The receiver shall

(a) on accepting a hazardous waste for storage, treatment or disposal,

(i) certify the receipt on the 3rd, 4th, 5th and 6th copies of the manifest, and

(ii) return the 4th copy to the carrier,

(b) mail the 3rd copy to the Director of Pollution Control of the Department within 2 days, excluding Saturdays and holidays, after receiving the hazardous waste,

(c) retain the 5th copy for at least 2 years after receiving the hazardous waste, and

(d) mail the 6th copy to the generator within 2 days, excluding Saturdays and holidays, after receiving the hazardous waste.

Retained copy

11 The generator shall retain the 6th copy for at least 2 years following its receipt from the receiver.

Multiple carriers' manifest

12(1) If multiple carriers are used for 1 consignment of a hazardous waste,

(a) the generator shall fill out 1 manifest form with respect to each carrier,

(b) each carrier, on acceptance of the waste for transport, shall

(i) certify the receipt of the waste on 1 form and return copies 1 and 2 of that form to the generator, and

(ii) deliver the remaining manifest copies or remaining manifest forms or both to the receiver or next carrier,

and

(c) the receiver shall, on receiving the hazardous waste,

(i) certify the receipt of the waste on the 3rd, 4th, 5th and 6th copies of all manifest forms,

(ii) cross-reference all of the manifest,

(iii) mail the 3rd copy of each manifest form to the Director of Pollution Control of the Department within 2 days, excluding Saturdays and holidays, after receiving the waste,

(iv) mail the 4th copy of the appropriate manifest to each carrier,

(v) retain the 5th copy of each manifest for at least 2 years after receiving the waste, and

(vi) mail the 6th copy to the generator within 2 days, excluding Saturdays and holidays, after receiving the waste.

(2) A generator shall retain a copy for at least 2 years following its receipt from a receiver under subsection (1)(c).

Storage facility

13 A person who stores a hazardous waste shall, in a manner satisfactory to the Director of Standards and Approvals of the Department, store it so that

(a) any leakage is contained and prevented from entering into the remainder of the storage site and places beyond, including sewers and the ground underneath the site,

(b) the hazardous waste is adequately labelled, stating the identity of the contained waste, and

(c) the place where the hazardous waste is stored

(i) is secured from public entry,

(ii) is prominently identified as a hazardous waste storage site,

(iii) is equipped with suitable equipment to handle emergency situations, and

(iv) is provided with operators trained to respond to emergency situations specific to the substances stored.

Storage

14(1) No person shall store a hazardous waste that he did not produce unless he is a holder of a licence to operate issued under the *Clean Water Act* by the Director of Standards and Approvals of the Department.

(2) No person shall store a hazardous waste

(a) for a period exceeding 365 days, or

(b) in an amount exceeding 10 tonnes.

(3) Notwithstanding subsection (2), a hazardous waste may be stored for a period exceeding 365 days or in an amount exceeding 10 tonnes if the person who stores the hazardous waste is a holder of a licence to operate issued under the *Clean Water Act* by the Director of Standards and Approvals of the Department.

Bond

15 A person who operates a hazardous waste management facility shall provide to the Minister, if the Minister so requires, a bond in a form and in an amount that the Minister considers appropriate, and with an obligor and obligee acceptable to the Minister, to secure the performance of that person's obligations under the Act, the regulations, any agreement entered into with the Corporation and any conditions imposed by the Corporation respecting the storage, collection, transportation and treatment of hazardous wastes and the disposal of hazardous wastes and waste matter resulting from the treatment of hazardous wastes.

Unauthorized release report

16 Where an unlawful or accidental discharge, emission, escape or spill of a hazardous waste occurs at a facility for the storage, treatment or disposal of hazardous wastes, the person responsible for the hazardous waste shall, immediately on becoming aware of the occurrence, notify the Director of Pollution Control of the Department.

Landfill disposal

17(1) Hazardous wastes, except for those listed in subsection (3), may be disposed of in landfills that are approved for that purpose by the Director of Standards and Approvals of the Department.

(2) The Director of Standards and Approvals of the Department may approve the disposal of liquid hazardous wastes in a landfill that is provided with

(a) 2 liners of which at least 1 is a synthetic liner,

(b) a leachate collection and removal system,

(c) a leak detection system between the 2 liners, and

(d) a ground water monitoring system.

(3) Hazardous wastes that may not be disposed of into a landfill are

(a) liquid and solid hazardous wastes containing tri-, tetra-, and pentachlorophenol in a concentration greater than 1000 milligrams per kilogram;

(b) liquid or solid hazardous wastes containing any 1 or more of the following organic solvents in a concentration greater than 1000 milligrams per kilogram:

(i) acetone;

(ii) benzene;

(iii) n-butyl alcohol;

(iv) carbon disulfide;

(v) carbon tetrachloride;

(vi) chlorobenzene;

(vii) cresols and cresylic acid;

(viii) cyclohexanone;

(ix) ethyl acetate;

(x) ethyl benzene;

(xi) ethyl ether;

(xii) isobutanol;

(xiii) methanol;

(xiv) methylene chloride;

(xv) methyl ethyl ketone;

(xvi) methyl isobutyl ketone;

(xvii) nitrobenzene;

(xviii) 2-nitropropane;

(xix) pyridine;

(xx) tetrachloroethylene;

(xxi) toluene;

(xxii) 1,1,1 and 1,1,2-trichloroethane;

(xxiii) trichloroethylene;

(xxiv) xylene;

(c) liquid hazardous wastes containing free cyanides in excess of 1000 milligrams per kilogram;

(d) liquid hazardous wastes or earthen materials including, gravel, sand, clay and soil, that contain more than 50 parts per million by weight of polychlorinated biphenyls;

(e) hazardous wastes with a pH less than 2.0;

(f) liquid hazardous wastes containing the following contaminants in an amount equal to or greater than that shown:

(i) arsenic	500 milligrams per kilogram;
(ii) cadmium	100 milligrams per kilogram;
(iii) chromium (Cr^{+6})	500 milligrams per kilogram;
(iv) lead	500 milligrams per kilogram;
(v) mercury	100 milligrams per kilogram;
(vi) nickel	134 milligrams per kilogram;
(vii) selenium	100 milligrams per kilogram;
(viii) thallium	130 milligrams per kilogram.

Repeal

18 *The Hazardous Waste Regulation (Alta. Reg. 49/85) is repealed.*

Coming into force

19 *This Regulation comes into force on April 1, 1988.*

SCHEDULE

TABLE 1

1 Hazardous wastes listed in this Table consist of

(a) the goods, substances, and waste streams listed in List II of Schedule II in the English version of the *Transportation of Dangerous Goods Regulations* (SOR 85-77) under the *Transportation of Dangerous Goods Act* (Canada), except for those goods or substances which have the numeral "37" appearing in Column IV of that list;

(b) any container, other than an empty container, that is larger than 5 litres in capacity, and that was used to hold any goods, substances or waste streams referred to in clause (a), except for those products or substances listed in Table 2;

(c) any unrinsed empty container larger than 5 litres in capacity that was used to hold any product or substance listed in Table 2.

2 Hazardous wastes defined by criteria in this Table are the following:

(a) any mixture or solution described by Classes 2 to 9 of section 3 in the English version of the *Transportation of Dangerous Goods Regulation* (SOR 85-77) made under the *Transportation of Dangerous Goods Act* (Canada), or

(b) any mixture or solution which contains 0.01 percent by mass or greater of any of the substances listed in section 1(a) with the numerals "9.2" appearing in Column III of the list referred to in section 1(a).

TABLE 2

CHEMICALS THAT MAKE UNRINSED EMPTY CONTAINERS HAZARDOUS WASTE

Substance

Acetaldehyde, chloro-
Acetamide, N-(aminothioxomethyl)-
Acetamide 2-fluoro-
Acetic acid, fluoro-, sodium salt
Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester
3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations greater than 0.3%
1-Acetyl 2-thiourea
Acrolein
Aldicarb
Aldrin
Allyl alcohol
Aluminum phosphide
5-(Aminomethyl)-3-isoxazolol
4-aAminopyridine
Ammonium picrate
Ammonium vanadate
Arsenic acid
Arsenic (III) oxide
Arsenic (V) oxide
Arsenic pentoxide
Arsenic trioxide
Arsine, diethyl-
Aziridine
Barium cyanide
Benzenamine, 4-chloro-
Benzenamine, 4-nitro-
Benzene, (Chloromethyl)-
1,2 Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]
Benzenethiol
Benzyl chloride
Beryllium dust
Bis(chloromethyl) ether
Bromoacetone
Brucine
Calcium cyanide
Camphene, octachloro-
Carbamimidoselenoic acid
Carbon bisulfide
Carbon disulfide
Carbonyl chloride
Chlorine cyanide
Chloracetaldehyde
p-Chloroaniline
1-(o-Chlorophenyl)thiourea
3-Chloropropiontrile
Copper cyanides
Cyanides (soluble cyanide salts), not elsewhere specified
Cyanogen
Cyanogen chloride
Dichlorophenylarsine
Dieldrin
Diethylarsine

Substance

0,0-Diethyl S-[2 (ethylthio)ethyl] phosphorodithioate
Diethyl-p-nitrophenyl phosphate
0,0-Diethyl 0-pyrazinyl phosphorothioate
Diisopropyl fluorophosphate
Dimethoate
3,3-Dimethyl-1-(methylthio)-2-butanone, 0-[(methylamino)carbonyl] oxime
0,0-Dimethyl 0-p-nitrophenyl phosphorothioate
Dimethylnitrosamine
alpha, alpha-Dimethylphenethylamine
4,6-Dinitro-e-cresol and salts
4,6-Dinitro-o-cyclohexylphenol
2,4-Dinitrophenol
Dinoseb
Diphosphoramide, octamethyl-
Disulfoton
2,4-Dithiobiuret
Dithiopyrophosphoric acid, tetraethyl ester
Endosulfan
Endothall
Endrin
Epinephrine
Ethanamine, 1,1-dimethyl-2-phenyl
Ethenamine, N-methyl-N-nitroso-
Ethyl cyanide
Ethylenimine
Famphur
Fluorine
Fluoroacetamide
Fluoroacetic acid, sodium salt
Fulminic acid, mercury (II) salt
Heptachlor
1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, endo- 1,4:5,8-dimethanonaphthalene
1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, exo- 1,4:5,8-demethanonaphthalene
1,2,3,4,10,10-Hexachloro- 1,4,4a,5,8,8a-hexahydro- 1,4:5,8-endo, endo-dimethanonaphthalene
1,2,3,4,10,10-Hexachloro- 1,4,4a,5,8,8a-hexahydro- 1,4:5,8-endo, exo-dimethaanonaphthalene
Hexachlorohexahydra-exo, exo-dimethanonaphthalene
Hexaethyl tetraphosphate
Hydrazinecarbothioamide
Hydrazine, methyl-
Hydrocyanic acid
Hydrogen cyanide
Hydrogen phosphide

TABLE 2 (continued)

Substance

Isocyanic acid, methyl ester
3(2H)-Isoxazolone, 5-(aminomethyl)
Mercury, (acetato-0)phenyl-
Mercury fulminate
Methane, oxybis(chloro-
Methane, tetranitro-
Methanethiol, trichloro-
4,7-Methano-1h-indene, 1,4,5,6,7 8,8-heptachloro-3a,4,7,7a-tetra-hydro-
Methomyl
2-Methylaziridine
Methyl hydrazine
Methyl isocyanate
2-Methyllactonitrile
Methyl parathion
alpha-Naphthylthiourea
Nickel carbonyl
Nichel cyanide
Nickel (II) cyanide
Nickel tetracarbonyl
Nicotine and salts
Nitric Oxide
p-Nitroaniline
Nitrogen dioxide
Nitrogen (II) oxide
Nitrogen (IV) oxide
Nitroglycerine
N-Nitrosodimethylamine
N-Nitrosomethylvinylamine
5-Norbornene-2,3-dimathanol, 1,4, 5,6,7,7-hexachlora, cyclic sulfite
Octamethylpyrophosphoramide
Osmium oxide
Osmium tetroxide
7-Oxabicyclo [2,2,1] heptane-2,3-dicarboxylic acid
Parathion
Phenol, 2-cyclohexyl-4,6-dinitro
Phenol, 2,4-dinitro-
Phenol, 2,4-dinitro-6-methyl-
Phenol, 2,4 dinitro-6-(1-methyl-propyl)-
Phenol, 2,4,6-trinitro, ammonium salt
Phenyl dichloroarsine
Phenylmercuric acetate
N-Phenylthiourea
Phorate
Phosgene
Phosphine
Phosphoric acid, diethyl p-nitro-phenyl ester
Phosphorodithioic acid, 0,0-dimethyl S-[2 (methylamino) 2-oxoethyl] ester
Phosphorofluoric acid, bis(1-methyl ethyl)-ester
Phosphorothioic acid, 0,0-diethyl S (ethylthio)methyl ester
Phosphorothioic acid, 0,0 diethyl 0-(p-nitrophenyl) ester

Substance

Phosphorothioic acid, 0,0-diethyl 0-pyrazinyl ester
Phosphorothioic acid, 0,0-dimethyl-0-[p-((dimethylamino-sulfonyl) phenyl] ester
Plumbane, tetraethyl-
Potassium cyanide
Potassium silver cyanide
Propanal, 2-methyl-2-(methylthio)-, 0[(methylamino)Carbonyl]oxime
Propanenitrile
Propanenitrile, 3-chloro-
Propanenitrile, 2-hydroxy-2-methyl-
1,2,3-Propanetriol, trinitrate-
2-Propanone, 1-bromo-
Propargyl alcohol
2-Propenal
2 Propen 1-ol
1,2 Propylenimine
2-Propyn-1-ol
4-Pyridinamine
Pyridine, (S)-3-(1-methyl-2-Pyrro-lidinyl)-, and salts
Pyrophosphoric acid, tetraethyl ester
Selenourea
Silver cyanide
Sodium azide
Sodium cyanide
Strontium sulfide
Strychnidin-10-one, and salts
Strychnidin-10-one, 2,3,-dimethoxy-
Strychnine and salts
Sulfuric acid, thallium(1), salt
Tetraethyldithiopyrophosphate
Tetraethyl lead
Tetraethylpyrophosphate
Tetranitromethane
Tetraphosphoric acid, hexaethyl ester
Thallic oxide
Thallium (III) oxide
Thallium (I) selenite
Thallium (I) sulfate
Thiofanox
Thiomidodicarbonic diamide
Thiophenol
Thiosemicarbazide
Thiourea (2-chlorophenyl)-
Thiourea, 1 naphthalenyl-
Thiourea, phenyl-
Toxaphene
Trichloromethanethiol
Vanadic acid, ammonium salt
Vanadium pentoxide
Vanadium (V) oxide
Warfarin, when present at concentrations greater than 0.3%
Zinc cyanide
Zinc Phosphide, when present at concentrations greater than 10%